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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/621,745 | 07/16/2003 | Christopher B. Wilkerson | 42P15755 | 1809 |

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EXAMINER

TRAN, DENISE

| | |
|----------|--------------|
| ART UNIT | PAPER NUMBER |
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2185

| SHORTENED STATUTORY PERIOD OF RESPONSE | MAIL DATE | DELIVERY MODE |
|--|------------|---------------|
| 3 MONTHS | 01/12/2007 | PAPER |

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/621,745

Applicant(s)

WILKERSON, CHRISTOPHER B.

Examiner

Denise Tran

Art Unit

2185

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 October 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 39-76 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 39-76 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. The applicant's response filed 10/19/06 has been considered. The new added claims 39-76 are presented for examination. Claims 1-38 have been canceled.
2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 39, 41-42, 44-47, 49, 56-60, 67-70, and 72 are rejected under 35 U.S.C. 102(b) as being anticipated by Wong et al., US 2002/0078061 A1 (hereinafter Wong).

Claim 39, Wong teaches an apparatus comprising:

a cache to hold a first cache line (e.g., fig. 4, el. 407, 411; [0035]) and
a correlation prefetcher to prefetch to the cache a second cache line correlated with the first cache line (e.g., [0018]; [0026]).

Claim 58, Wong teaches a method comprising:

holding a first cache line in a cache (e.g., fig. 4, el. 407, 411; [0035]);
identifying a second cache line correlated with the first cache line (e.g., [0018]; [0026]); and
prefetching the second cache line to the cache (e.g., [0018]; [0026]).

Claim 69. Wong teaches an apparatus comprising:

a cache for holding a first cache line (e.g., fig. 4, el. 407, 411; [0035]); and
means for prefetching to the cache a second cache line correlated with the first
cache line (e.g., [0018]; [0026]).

Claims 41, 42, 44-47, 49, 56, 57, 59-60, 67, 68, 70, and 72, Wong teaches the
correlation prefetcher is to identify the second cache line as being correlated with the
first cache line based on how frequent the second cache line is loaded subsequent to
the first cache line (i.e., other than most recently used; prefetch hits; e.g., [0026]) or
[0022]); the correlation prefetcher is to identify the second cache line as being
correlated with the first cache line based on an age of the second cache line relative to
that of the first cache line (i.e., time or reference; e.g., [0017], [0019]-[0022], [0026]); the
correlation prefetcher is to identify the second cache line based on a link associated
with the first cache line (i.e., miss address, set, time or reference or key-successor; e.g.,
[0017] [0019]-[0022]); the cache is to hold the link in association with the first cache line
(e.g., [0035]); the correlation prefetcher is to identify a correlated cache line for multiple
cache lines (e.g., [0026]); the correlation prefetcher is to generate a link identifying a
correlated cache line for multiple cache lines (e.g., [0026]); the correlation prefetcher is
to identify a correlated cache line for multiple cache lines based on relative ages of
cache lines (e.g., [0026], [0027]); the cache is to hold a third cache line and wherein the
correlation prefetcher is to prefetch a fourth cache line based on how recent the fourth
cache line has been used if the correlation prefetcher is to not prefetch a cache line

correlated with the third cache line (e.g., [0026]; [0027]); the cache is to hold a third cache line and wherein the correlation prefetcher is to prefetch a fourth cache line based on how frequent the fourth cache line has been used if the correlation prefetcher is to not prefetch a cache line correlated with the third cache line (i.e., other than most recently used; prefetch hits; e.g., [0026]) or [0022]); means for identifying the second cache line as being correlated with the first cache line (e.g., [0015]).

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 40, 50-55, 62-66, and 71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong et al., US 2002/0078061 A1 (hereinafter Wong) as applied to claims 39, 58, 69 above, and further in view of Dean et al. US 2002/0152361 (herein after Dean).

Claims 40, 50-55, 62-66, and 71, Wong shows the claimed limitations as discussed above. Wong does not explicitly show the second cache line from another cache; the second cache line to replace the first cache line; a predictor to identify whether the first cache line is to be replaced; the predictor is to identify whether the first cache line is to be replaced based on instructions that used the first cache line during a current residency in the cache; the predictor is to identify whether the first cache line is to be replaced based on an age of the first cache line relative to an age value; the

predictor is to identify whether the first cache line is to be replaced based on an age of the first cache line relative to that of other cache lines in the cache and relative to an age value; the predictor is to identify whether the first cache line is to be replaced based on whether the first cache line is likely to be used at an age beyond an age value. Dean shows the second cache line from another cache (e.g., [0025]; the second cache line to replace the first cache line (e.g., [0025]) ; a predictor to identify whether the first cache line is to be replaced (e.g., [0025]; [0017]); the predictor is to identify whether the first cache line is to be replaced based on instructions that used the first cache line during a current residency in the cache (e.g., [0025]; [0017]); the predictor is to identify whether the first cache line is to be replaced based on an age of the first cache line relative to an age value (e.g., [0025]; [0017]); the predictor is to identify whether the first cache line is to be replaced based on an age of the first cache line relative to that of other cache lines in the cache and relative to an age value (e.g., [0025]; [0017]; [0032]); the predictor is to identify whether the first cache line is to be replaced based on whether the first cache line is likely to be used at an age beyond an age value (e.g., [0025]; [0017]; [0032]). It would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the teaching of Dean into the system of Wong because it would improve cache hit rate and system performance.

6. Claims 48 and 73-75 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong et al., US 2002/0078061 A1 (hereinafter Wong), in view of Witt US 6332187.

Claim 73, Wong teaches a system comprising:

a processor including a cache to hold a first cache line (e.g., fig. 4, cache 407) and including a correlation prefetcher to prefetch to the cache a second cache line correlated with the first cache line (e.g., [0015]; [0035]. Wong does not explicitly show an audio input/output device. Witt shows an audio input/output device (e.g., col. 22, lines 55-60). It would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the teaching of Witt into the system of Wong because it would allow a variety of peripheral devices coupled to the system, thereby increasing system functionality .

Claim 48, Wong shows the claimed limitations as discussed above and shows the correlation prefetcher is to identify from one set of a cache a correlated cache line for multiple cache lines in the one set (e.g., [0015]). Wong does not explicitly show a set associative cache. Witt shows a set associative (e.g., col. 10, lines 20-30). It would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the teaching of Witt into the system of Wong because it would reduce complexity and increase speed of a cache in the system.

Claims 74-75, Wong teaches the correlation prefetcher is to identify the second cache line as being correlated with the first cache line based on how frequent the second cache line is loaded subsequent to the first cache line (i.e., other than most recently used; prefetch hits; e.g., [0026]) or [0022]); the correlation prefetcher is to identify the second cache line as being correlated with the first cache line based on an age of the second cache line relative to that of the first cache line (i.e., time or reference; e.g., [0017], [0019]-[0022], [0026]) .

7. Claims 43 and 61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong et al., US 2002/0078061 A1 (hereinafter Wong) as applied to claims 39, 58, 69 above, and further in view of Dean et al. US 2002/0152361 (herein after Dean) and Witt US 6332187.

Claims 43 and 61, Wong shows the claimed limitations as discussed above and teaches the first and second cache lines in a same set (e.g., [0015]). Wong does not explicitly show the second cache line from another cache. Dean shows the second cache line from another cache (e.g., [0025]). It would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the teaching of Dean into the system of Wong because it would improve cache hit rate and system performance. The combination of Wong and Dean does not explicitly show a set associative cache. Witt shows a set associative (e.g., col. 10, lines 20-30). It would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the teaching of Witt into the combined system of Wong and Dean because it would reduce complexity and increase speed of a cache in the system.

8. Claim 76 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wong et al., US 2002/0078061 A1 (hereinafter Wong) in view of Witt US 6332187 as applied to claim 73 above, and further in view of Dean et al. US 2002/0152361 (herein after Dean).

Claim 76, the combination of Wong and Witt teaches the claimed limitations as discussed above. Wong and Witt do not teach a predictor to identify whether the first cache line is to be replaced. Dean teaches a predictor to identify whether the first

cache line is to be replaced (e.g., [0025], [0021]).]). It would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the teaching of Dean into the system of Wong and Witt because it would improve cache hit rate and system performance.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Denise Tran whose telephone number is (571) 272-4189. The examiner can normally be reached on Monday and Thursday from 8:45 a.m. to 5:15 p.m.. The examiner can also be reached on alternate Friday

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sanjiv Shah, can be reached on 571-272-4098. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Denise Tran
1/1/07

